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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/785,524	02/24/2004	Kuen-Chyr Lee	TS01-1693	8305

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EXAMINER	
DANG, TRUNG Q	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 02/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/785,524	KUEN-CHYR LEE	
	Examiner	Art Unit	
	Trung Dang	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-23 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-23 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 24 February 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 4/29/04.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1, 3, 6-10, 12, 14, 17-21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soman et al. (US 2004/0192002) in view of Kovacic et al. (US 6,346,453 cited by applicants).

With reference to Fig. 3D and Fig. 5, Soma teaches a method for making a silicon germanium (SiGe) layer on a substrate for a base of an NPN bipolar transistor comprising the steps of:

providing said substrate having a shallow trench isolation region 206 surrounding a device area with an n-type dopant (para. [0024]);

depositing an insulating layer 208 on said substrate, and patterning to forming an opening over said device area (para. [0026]);

forming a blanket seed layer 210 on said substrate and said insulating layer 208 at a temperature between 700 °C and 850 °C (Fig. 5, step 512);

forming said SiGe layer 212 in-situ doped with boron (p-type dopant), and

forming a silicon cap layer on said SiGe layer at a temperature between 600 °C and 650 °C (Fig. 5, steps 516-520);

patterning said silicon cap layer, said SiGe layer, said seed layer to said insulating layer to form a SiGe base over said device area (Fig. 3D).

Soman differs from the claims in that while Soman forms opening 209 over device area by patterning the nitride layer 208, the claims call for the formation of such opening by patterning a polysilicon layer and an underlying layer of oxide.

Kovacic teaches a SiGe-based heterojunction bipolar transistor (HBT) in which opening over the device area are formed by patterning a polysilicon layer 201 and an underlying layer of SiO2 (Fig. 14).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Soman's teaching by forming the opening 209 in a manner depicted in Fig. 14 because the polysilicon layer provides a surface upon which the SiGe layer will adhere, and forms an electrical contact to the SiGe layer (see Kovacic col. 7, lines 1-2).

Note that as for independent claim 12, although Soman is silent about the reduction of grain size of the seed layer over the shallow trench isolation region and the formation of SiGe/Si cap layer at a second temperature to minimize profile of boron, such properties are inherently present in Soman's process because the deposition temperature ranges of the seed layer 210 and the SiGe layer 212 are overlapped with that of disclosed and claimed in the instant application.

For claims 6 and 17, see para. [0030] in Soman for the seed layer thickness.

For claims 7 and 18 concerning the duration of which the seed layer is deposited, it is noted that the determination of such duration would have been obvious to one skilled in the art because the seed layer thickness of the prior art and the seed layer thickness of the claims are of the same range.

For claim 14, the determination of the dopant concentration of the subcollector (substrate 204 in Soman) for a HBT device would have been obvious because it is well settle that, absent a showing of criticality or unexpected result by applicant, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d (Fed.cir), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed concentration or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen concentration or upon another variable recited in the claim, the applicant must show that the chosen concentration are critical. *In re Woodruff*, 919 F.2d, 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

For claims 8 and 19, see para. [0033] for the SiGe layer thickness.

For claims 9 and 20, see para. [0041].

For claims 10 and 21, see para. [0034].

2. Claims 2, 4-5, 13, 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soman et al. taken with Kovacic et al. as applied to claims 1, 3, 6-10, 12, 17-21, and 23 above, and further in view of Hsieh et al. (US 5,315,151).

The combined process of Soman and Hsieh teaches a method as described in the above rejection.

The combination differs from the claims in not disclosing a) the substrate having a crystallographic orientation of <100>, b) the underlying silicon oxide and the polysilicon are formed by chemical vapor deposition (CVD).

Hsieh teaches a method for forming a bipolar transistor in which the device is formed on a substrate having a <100> crystal orientation (col. 4, lines 18-22. Furthermore, an underlying silicon oxide layer and a boron-doped polysilicon layer in an extrinsic base region are formed by CVD (col. 5, lines 20-27).

It would have been obvious to of ordinary skill in the art at the time the invention was made to modify the combined teaching of Soman and Kovacic by forming the HBT on a substrate having a <100> crystal orientation as suggested by Hsieh because such is conventional in the art. Furthermore, forming the underlying oxide layer and the polysilicon layer by CVD would have been obvious to one skilled in the art because CVD is known as a common process in the deposition of silicon oxide and polysilicon, and the application of a known technique to make the same would have been within the level of one skilled in the art.

As for the limitations regarding the thickness of the oxide layer, the thickness of the polysilicon layer, and the dopant concentration of the polysilicon layer, it is noted that such process parameters are merely a matter of optimization for the same reason mentioned above.

3. Claims 11 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soman et al. taken with Kovacic et al. as applied to claims 1, 3, 6-10, 12, 17-21, and 23 above, and further in view of Gomi et al. (5, 846,867).

The combined process of Soman and Hsieh teaches a method as described in the above rejection.

The combination differs from the claims in disclosing that the SiGe layer is deposited by CVD rather than by molecular-beam epitaxy (MBE) as claimed.

Gomi teaches SiGe can be deposited by means of MBE or CVD (col. 13, lines 7-10.

The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process by depositing the SiGe layer by MBE as suggested by Gomi because both CVD and MBE are recognized in the art as a mean to deposit SiGe, and the substitution of one technique for another art-recognized technique to make the same would have been within the level of one skilled in the art. The employment of MBE to form the SiGe layer would not support the patentability of the subject matter encompassed by the prior art unless there is evidence indicating such application is critical.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trung Dang
Primary Examiner
Art Unit 2823

2/22/05